CHAPTER 9

States of Consciousness

I had been unfairly accused of taking something though I couldn't really remember what it was. Nobody wanted to hear my side of the story. My friends and family wouldn't listen, and they actually started chasing me in hopes of turning me into the authorities. Presumed guilty instead of innocent, I feared I was going to be arrested, tried, and convicted without any hope of legal assistance. Cornered and frightened, with no place to hide, I thankfully woke up.

The emotions and events of this dream seemed so real that I had a lot of trouble getting back to sleep. There was even a slight moment of pause, after waking, where I had to reassure myself, "That was a dream, right? Yes. Phew!"

Dreaming is merely one of the altered states of consciousness we will examine in this three-module chapter. We also will be taking a close look at the research and beliefs about hypnosis, and drug use and addiction.

MODULE 20

Sleep, Dreams, and Body Rhythms

What's the Point? 1. What is consciousness?

Has this ever happened to you? You're watching a movie with friends or family late at night, and no matter how hard you fight it, you simply cannot keep your eyes open. Or perhaps you've waged a similar struggle while reading a textbook (but certainly not your psychology text) late at night. You fight it, but soon you nod off—sleep wins again.

You don't stand much of a chance in the tiredness battle; virtually every night, sleep wins. And when you do stay up later than you should, the effects are often obvious. The day a 10-page term paper is due, I can easily spot those who, having waited until the last minute, spent most of the previous night at a keyboard. Fighting the "nods," heads bobbing downward, they suddenly jerk upright after a brief trip to never-never land.

Bored Senseless or Sleep-Deprived? This student has clearly lost any struggle to stay awake.

To nod off is to temporarily lose waking consciousness, or awareness of yourself and your environment. Depriving yourself of sleep alters your body's natural rhythms, making it difficult to maintain normal, waking consciousness. Indeed, your body has several naturally occurring rhythms affecting wakefulness and sleep.

Body Rhythms

2. How do your body's natural rhythms differ from one another?

An e-mail titled "Reliably Predict Your Mood for Free" once caught my eye. Closer investigation showed the predictions were anything but reliable, and certainly not free. This advertisement pitched something called a "biorhythm chart," which was a good example of a **pseudoscientific claim**—an assertion that attempts to appear scientific but is not really based on science.The e-mail guaranteed that after I typed in the time and date of my birth, their chart could accurately predict my good and bad days, my illnesses and accidents, and even the days when I should gamble. (Gullibility level was not predicted.)

Researchers have found that pseudoscientific biorhythm charts are useless (Hines, 1998). Researchers who have drawn random samples from regular users of these charts could not produce replicable results—meaning that if you recreate the same test, under the same conditions, the results will vary. Your body does, however, have real **biological rhythms**, which affect physiological processes such as body temperature, blood pressure, and the effectiveness of medicines. These rhythms fall into three main categories:

- **Circadian rhythms** occur approximately once during a 24-hour period (*circa* and *dies* in Latin mean "about" and "day," respectively). The sleep-wake cycle is an example of a circadian rhythm.
- **Ultradian rhythms** occur more than once a day. The most studied ultradian rhythm is the way we cycle through various stages of sleep each night. (You'll read more about these stages very shortly.)
- **Infradian rhythms** take place less than once a day. They may occur once a month, as with a woman's menstrual cycle (see Thinking Critically: Infradian Rhythms and PMS, pages 380–381), or once a season, as with a bear's winter hibernation.

We are aware of some of these rhythms as we cycle through them, but most run on autopilot, rarely generating a second thought. An understanding of your body's natural rhythms may help you get more out of your day—and night.

► **consciousness** Awareness of yourself and your environment.

► **pseudoscientific claim** Any assertion that is not based on science, even though in some circumstances, attempts are made to appear scientific.

► **biological rhythms** Periodic physiological fluctuations

► **circadian (ser-KAY-dee-un) rhythms** Biological rhythms (for example, of temperature and wakefulness) that occur approximately every 24 hours.

► **ultradian (ul-TRAY-dee-un) rhythms** Biological rhythms that occur more than once each day.

► **infradian (in-FRAY-dee-un) rhythms** Biological rhythms that occur once a month or once a season.

Sleep and Sleep Deficit

3. What are the costs to your body when you don't get enough sleep?

Live to be 90, and you will have spent roughly 30 years of your life with your eyes closed, mostly oblivious to your surroundings. Ironically, few of us know much at all about the gentle tyrant that drives us to bed each night. We may know even less about what happens to our mind and body if we don't get the sleep we need. The research on sleep deprivation, however, could not be clearer:

- Lack of sleep decreases the levels of hormones necessary for proper immune system functioning. Sleep deprivation also increases levels of the stress hormone cortisol, which has been linked to the damage of brain cells responsible for learning and memory (Leproult & others, 1997).
- Citing the number of road deaths related to truck drivers and others who fall asleep while driving, the National Transportation Safety Board (1995) considers driver fatigue a bigger safety problem than alcohol use. Figure 20.1, which dramatically illustrates the effect of one hour of lost sleep, supports this position.
- Sleep debt contributes to hypertension, impaired concentration, irritability, suppression of cancer-fighting immune cells, and premature aging (Dement, 1999; Horne, 1989; Spiegel & others, 1999).

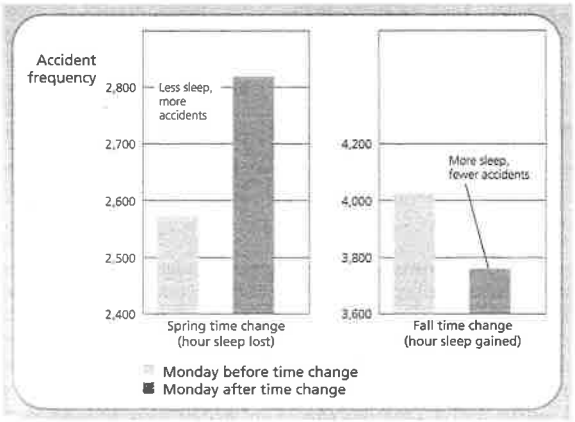


Figure 20.1 Spring Forward, Fall Back? Compare the frequency of accidents on the Mondays before and after we lose an hour to daylight saving time in the spring. In the fall, the opposite trend appeared (National Transportation Safety Board, 1995).

Thinking Critically

Infradian Rhythms and PMS

Controversy surrounds the concept of PMS, or "premenstrual syndrome." Over the objection of psychologists, PMDD (premenstrual dysphoric disorder) was added to the list of potential disorders (requiring further study) listed in the book that thousands of health-care officials use to diagnose mental illness. To understand why psychologists objected, you need to know a bit more about PMS and infradian rhythms.

A woman's menstrual cycle is, on average, a 28-day infradian cycle. During this cycle, the woman's uterine wall is preparing for possible pregnancy. If conception does not occur, the uterine wall sloughs off its thickened lining and the cycle starts again. Do emotional or intellectual changes accompany these physical changes? Tradition says "yes," but psychologists doing research in this area give us reasons to reconsider this assumption.

Several studies (for example, Gallant & others, 1991; Hardie, 1997; McFarlane & others, 1988; Slade, 1984) have gathered data by polling women about their psychological and physical health. To avoid biasing the results, the researchers did not tell the women why they were gathering the data. They asked each woman for a single day's data, and later they ascertained the corresponding day of the woman's menstrual cycle. Some of the researchers compared their results with data from men and data from women in other cultures. The findings were remarkably consistent:

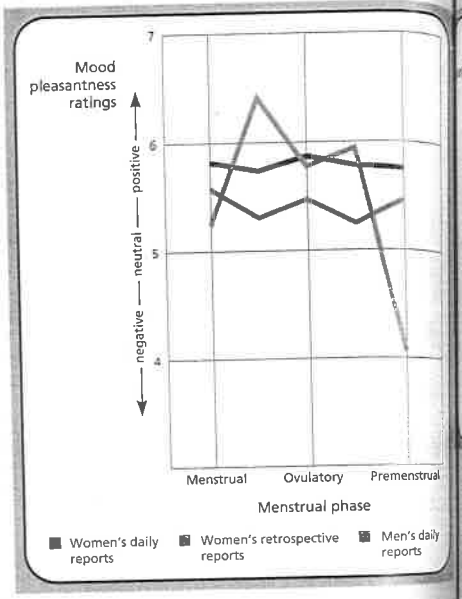


Figure 20.2 PMS or Normal Variation? Men's and women's moods fluctuate at about the same rate during any given month. However, the moods recalled by women do not match the actual moods reported day-by-day during the month (McFarland & others, 1989).

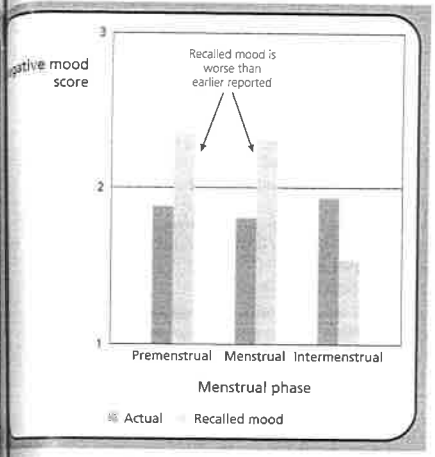


Figure 20.3 Actual Mood Versus Perceived Mood This graph shows that women's *recalled* moods do not reflect the *actual* moods they reported during the menstrual cycle.

- Gender differences in mood are nonexistent (Figure 20.2). In one study (McFarlane & others, 1988), women and men report the same number of actual mood swings each month, although women later recalled having more mood swings (McFarland & others, 1989).
- The menstrual cycle has little effect on actual mood (Figure 20.3) (McFarland & others, 1989).
- There is no reliable relationship between the menstrual cycle and memory, creativity, exam scores, problem solving, or work efficiency (Golub, 1992).
- From a cultural standpoint, the idea of a premenstrual set of symptoms is a uniquely Western phenomenon (Parlee, 1994).
- Women complaining of PMS and given a placebo (inactive pill) report just as much relief as those given an actual drug (Richardson, 1993).

These findings are out of sync with our traditional assumptions. Perhaps the definition of PMS can offer some insight. Checklists for PMS include sadness, irritability, headaches, insomnia, and lethargy. Doesn't everybody at some time or another experience these symptoms? Does that mean we all have PMS? Or could it mean that we need to reconsider PMS altogether?

With the evidence mounting against late nights, you'd think that a movement toward turning lights out earlier would gain momentum. Wrong. Teenagers are getting almost two hours less sleep now than they did 70 years ago, before the days of all-night drive-throughs, the Internet, and late-night TV channels (Maas, 1998). Four out of five students are "dangerously sleep deprived," according to sleep researcher William Dement (1999). Dement states, "The brain keeps an accurate count of sleep debt," which helps explain why many high school students sleep effortlessly until noon on weekends if allowed. He matter-of-factly adds that, given the damage improper rest inflicts on your brain, a large sleep debt "makes you stupid." Are you getting the sleep you need? To find out, answer the questions in Table 20.1, page 382. Most teens need nine hours sleep each night. If you need an alarm to interrupt the sleep your body still wants, you're not getting enough.

► **William Dement** (1928–) Sleep researcher who coined the term *REM*.

TABLE 20.1 ARE YOU SLEEP DEPRIVED?

Cornell University psychologist James Maas reports that most college students suffer the consequences of sleeping less than they should. To see if you are headed toward being in that group, answer the following true-false questions:

TRUE	FALSE	
—	—	1. I need an alarm clock in order to wake up at the appropriate time.
—	—	2. It's a struggle for me to get out of bed in the morning.
—	—	3. Weekday mornings I hit the snooze bar several times to get more sleep.
—	—	4. I feel tired, irritable, and stressed out during the week.
—	—	5. I have trouble concentrating and remembering.
—	—	6. I feel slow with critical thinking, problem solving, and being creative.
—	—	7. I often fall asleep watching TV.
—	—	8. I often fall asleep in boring meetings or lectures or in warm rooms.
—	—	9. I often fall asleep after heavy meals.
—	—	10. I often fall asleep while relaxing after dinner.
—	—	11. I often fall asleep within five minutes of getting into bed.
—	—	12. I often feel drowsy while driving.
—	—	13. I often sleep extra hours on weekend mornings.
—	—	14. I often need a nap to get through the day.
—	—	15. I have dark circles around my eyes.

If you answered "true" to three or more items, you probably are not getting enough sleep. To determine your sleep needs, Maas recommends that you "go to bed 15 minutes earlier than usual every night for the next week—and continue this practice by adding 15 more minutes each week—until you wake without an alarm clock and feel alert all day." (Quiz reprinted with permission from James B. Maas, *Power sleep: The revolutionary program that prepares your mind and body for peak performance* [New York: HarperCollins, 1999].)

Why We Sleep

4. How do we benefit from sleeping?

What causes us to sleep? One hundred years ago, Russian physiologist Ivan Pavlov believed sleep resulted from what he called "massive inhibition." Others suggested that neurons disconnected from one another, causing us to "drift off." Though we have come a long way technologically since the days of Pavlov, we still have no complete answer to this question. But scientists have gathered some partial answers by looking at the brain and nervous system.

The control center for the 24-hour rhythm of sleep appears to be the brain's *hypothalamus*. You have a sort of sensor in your hypothalamus, which monitors changes in light and dark. Perceiving certain key changes in light level, your hypothalamus sends neurological messages to parts of your brain and body, initiating the changes that will put you to sleep. These physiological changes often involve the increase or decrease of *hormones* (chemical messengers) in your bloodstream.

One such hormone, **melatonin**, has been linked to regulation of the sleep-wake cycle (Haimov & Lavie, 1996). Wake up in the morning, turn on the light or open the curtains, and the melatonin levels that built up while you slept will start to drop again. Your melatonin levels will continue to drop until the next time you turn out the lights, close your eyes, and go to sleep. Some people with insomnia respond favorably to medically controlled amounts of melatonin supplements.

► **melatonin** A hormone that helps regulate daily biological rhythms.

So, we know something about *how* we go to sleep, but *why* do we need to sleep? Why can't we simply stay up, day after day, doing the things we want to do? Two possible answers to these questions revolve around the concepts of *preservation* and *restoration*.

If you've ever walked through your home in the dark without turning on lights and crashed into something, you can understand how sleep might help keep us safe. Such night-time crashes must have been even more common for our ancestors, who lived in caves and on cliffs. Traveling or hunting at night (well before the invention of the flashlight) was treacherous, and perhaps those who attempted it did not survive long enough to reproduce and pass along their genes. Sleep provides *protection* from nighttime's dangers, at least for daytime mammals like us. The sleep cycles of other animals have adapted in different ways, depending on such factors as ability to hide, species-specific habits, and need for nourishment (Webb, 1982). Bats, for example, sleep 20 hours a day. Cats sleep 15, but elephants drift off for only 3 to 4 hours. The adaptation theory holds that we sleep at times of the night or day that maximize our safety and survival.

Another prominent theory suggests that sleep is restorative, allowing us to recuperate from the everyday wear and tear we put ourselves through. Our brain and body remain active while we sleep. We may undergo a rebuilding process, as tissues are restored, memories are consolidated, and things learned on the previous day are reorganized.

Sleep Command Center The hypothalamus, colored red in this MRI brain scan photograph, sends messages to other parts of the brain, saying "Time to sleep."

Sleep Stages, REM, and Dreaming

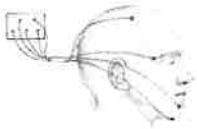
The Stages of Sleep

5. What are the four stages of nondreaming sleep?

The sleep-wake cycle itself is circadian, but we all have a 90-minute *ultradian* rhythm cycling throughout our night's sleep. During the 90-minute cycle, two types of sleep occur, in a series of regular, repeating stages. How do we know this? Because sleep researchers have measured the brain waves, eye movements, and muscle tension of sleeping people. The challenges in gathering sleep data are twofold:

1. The person whom you're studying must be asleep.
2. The person must also agree to have a minimum of five electrodes glued to his or her head (Figure 20.4)! The electrodes, which are connected to an **electroencephalograph (EEG)**, are collecting brain wave measurements (not delivering shocks!), so the procedure is painless.

Nap Time? Could you sleep with electrodes attached to your face and head? Sleep research participants must and do adapt to this inconvenience.



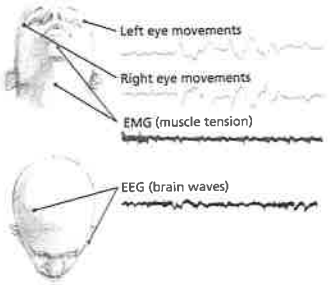


Figure 20.4 Measuring Sleep Sleep researchers use electrodes to measure brain waves, eye movements, and muscle tension while we sleep. They can use the changes in these measurements to label the different stages of sleep and dreaming.

Fortunately, thousands of volunteers have submitted to sleeping under observation with electrodes on. Would you volunteer to be a participant in a sleep study? For a few minutes, let's suppose you would. Here's what would happen.

As you try to relax, drifting from wakefulness to sleep, your brain waves cycle more and more slowly. As you nod off for the benefit of science, you will cycle through four stages of relatively quiet sleep before you go into a more active dreaming state (Figure 20.5). You will not be able to tell the exact moment you enter *Stage 1*, but a sleep researcher, noticing your slowed breathing and irregular brain waves, could accurately point to these first moments of sleep, which rarely last longer than five minutes (Figure 20.6). It would be easy to awaken you from this stage, and if we did, you'd probably insist you had not been sleeping. You may also report that you had fantastic, dreamlike sensations, such as falling.

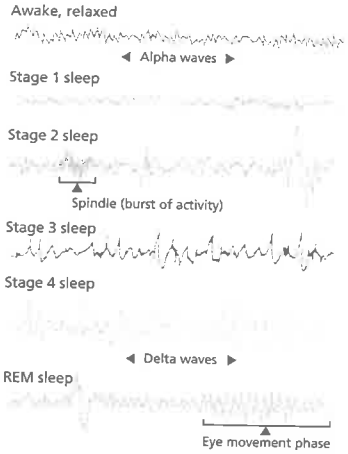


Figure 20.5 Brain Waves and Sleep Stages Brain waves slow down as we cycle into the deeper stages of sleep.

But let's imagine that we did not awaken you. As you exit Stage 1, your brain waves cycle more slowly, and you slide into the deeper sleep of *Stage 2*. Little brain wave bursts called spindles characterize this stage. The first time you enter Stage 2, your stay lasts 20 minutes. Over the course of the night, you will spend up to half of your entire time asleep in this stage.

Figure 20.6 Entering the Land of Nod You wouldn't be able to say precisely when you fell asleep last night, but a sleep researcher charting your brain waves could pinpoint the time very accurately.

About 30 minutes after you fall asleep, your brain waves begin to slow way down as you drop into *Stages 3* and *4*. These two stages, identified by the increasing percentage of large, slow *delta wave* cycles per second, together are called *slow-wave sleep*, or **delta sleep**. Your brain waves slow down to less than one cycle per second in delta sleep, compared with the 15 or so cycles per second you experienced just after you closed your eyes. The first time you travel through this ultradian cycle, your rejuvenating delta sleep will last about 30 minutes.

REM Sleep

6. Why is REM sleep sometimes called "paradoxical" sleep?

Up to this point, you've been cycling down through the four stages of **N-REM sleep**, or *non–rapid eye movement sleep*. After you reach Stage 4, your brain waves will begin to pick up a little speed and strength. You will move back up through Stages 3, 2, and 1, and then you will enter

► **electroencephalograph (EEG)** A machine that amplifies and records waves of electrical activity that sweep across the brain's surface. Electrodes placed on the scalp measure these waves.

► **spindles** Bursts of brain-wave activity that characterize Stage 2 of N-REM sleep.

► **delta sleep** Stages 3 and 4 of N-REM sleep, characterized by large, slow delta waves; delta sleep is minimal during the last four hours of sleep.

► **N-REM sleep (non–rapid eye movement sleep)** The period of sleep in which sleep Stages 1 through 4 occur; not characterized by eye movement or vivid dreams.

► **REM sleep** Rapid eye movement sleep; a recurring sleep stage during which vivid dreams commonly occur. Also known as *paradoxical sleep*, because muscles are relaxed but other body systems are active.

your first period of rapid eye movement sleep, or REM sleep, a type of sleep in which your eyes move rapidly under your closed lids, and you dream vividly. Your initial REM period will not last long, and after it ends, the cycle will start again from Stage 1. This 90-minute ultradian rhythm continues all night, though delta sleep drops out of the cycle after the second or third time through. The last four hours of sleep, assuming you get the eight to nine hours you're supposed to, are pretty much spent alternating between Stage 2 and REM (Figure 20.7).

REM sleep is very different from any N-REM sleep stage. During REM sleep, your brain patterns more closely resemble those of relaxed wakefulness than any of the other sleep stages. Not only do the eyes dart about under closed eyelids, but also the pulse quickens and breathing becomes faster and irregular. Blood flows into the genitals at a rate faster than it can be removed. But despite all this internal activity, the electrode measuring muscle tension in your chin would show a flat line on the EEG, because you are, in essence, temporarily paralyzed during REM sleep. Your brainstem blocks messages from your motor cortex, the brain structure that controls your movements. This is why REM sleep is sometimes called *paradoxical* sleep: Internally, your body is aroused; externally, you're the picture of calm, and hard to awaken.

What's going on in our brains to produce all that internal activity? We're dreaming. Over 80 percent of people awakened during REM sleep report that the wak-up call interrupted a dream. REM sleep consumes about 25 percent of your nightly sleep, which means that you spend 100 minutes each night dreaming, whether you remember a second of it or not. This holds true for everyone. We *all* dream every night of our lives.

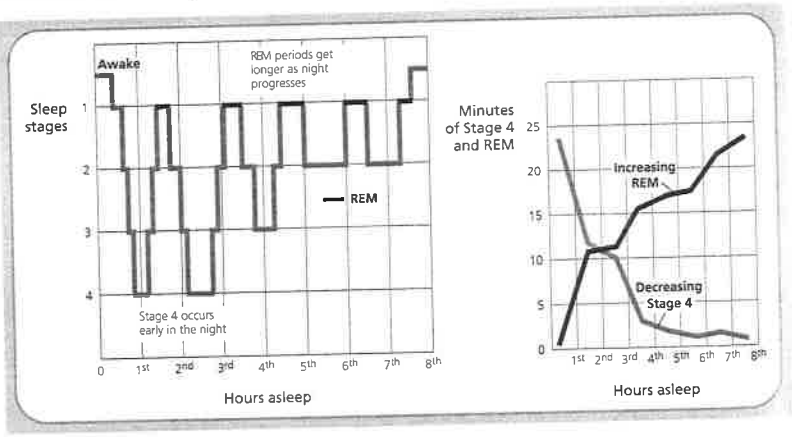


Figure 20.7 A Good Night's Sleep We cycle through sleep stages all night. The graph on the left shows that as we sleep, we cycle down into deeper stages of sleep and back up, where we enter REM sleep. The graph on the right shows how REM sleep increases as the night wears on.

Why Do We Dream?

7. What are three modern explanations of dreaming?

There are several theories of why we dream. Sigmund Freud contributed psychology's earliest dream theory. In his book *The Interpretation of Dreams,* published over a century ago, Freud wrote that dreams were the key to understanding our inner conflicts. He believed that dreams were expressions of wish fulfillment, and that most dreams could be "traced back through analysis to erotic wishes." Modern theories of dreaming offer at least three more plausible explanations:

- ***Information-processing*** Dreams serve an important memory-related function by sorting and sifting through the day's experiences and tying up loose ends. Research shows REM sleep facilitates memory storage, and the amount of REM sleep increases following stressful times (McGrath & Cohen, 1978; Palumbo, 1978).
- ***Physiological function*** Neural activity during REM sleep provides periodic stimulation for our brains. Infants, whose brains are developing at a fantastic rate, spend significantly more time than their adult counterparts do in REM sleep (Figure 20.8). The discovery that the pituitary gland secretes a growth hormone *during* delta sleep supports this theory. Weren't we always told as young children, "If you don't get your sleep, it will stunt your growth"? The growth hormone secreted while we sleep suggests we should have listened to this advice.

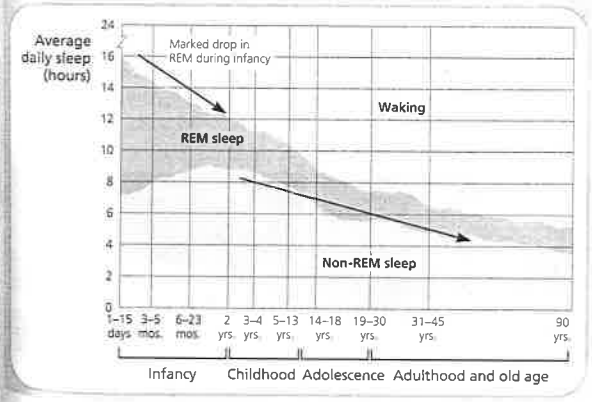


Figure 20.8 Sleep and Age Sleep patterns change as we grow older (Snyder & Scott, 1972).

The Meaning of Dreams? Marc Chagall's painting *I and the Village* captures what a dream can look like to the dreamer: colorful, confusing, and possibly filled with meaning.

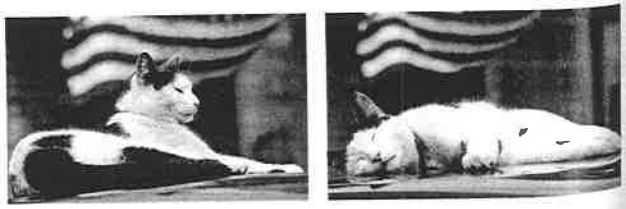
- *Activation-synthesis* Rather than ascribing any physiological or memory-related status to dreams, this theory suggests that dreams are simply the mind's attempt to make sense out of random neural firing in the various regions of the "sleeping" brain. That is, the brain's attempt to interpret random neural activity during sleep creates a dream.

We are not the only animals who experience REM sleep. We don't know if other animals are actually having dreams, but nearly all animals, from sheep to walruses, show measurable REM periods while hooked up to an EEG during sleep. (Just how do they keep the electrodes on the walruses?) Such evidence suggests a biological *need* for REM sleep. We do know that people don't feel rested unless their sleep has contained REM periods. Also, when finally allowed to sleep after a period of sleep deprivation, we tend to dive straight into REM sleep rather than following the normal cycle. Further, REM does not occur in fish, whose behavior (unlike mammals) is governed more by instinct and less by learning, supporting the information-processing model. The truth behind dreams, once discovered, will surely encompass both psychological and biological explanations.

Sleep Disorders and Sleep Problems

8. What are some common sleep disorders, and what are their consequences?

Not everyone follows the normal sleep patterns we've been discussing. Some people experience serious sleep disruptions or problems related to sleep, such as insomnia, sleep apnea, and narcolepsy.



Cat Nap The cat in N-REM sleep (left) is sleeping comfortably. On entering REM sleep, the cat's brain stops sending the signals to the muscles that let the cat hold its head off the floor.

Insomnia

Who among us has never spent a restless night, tossing and turning, unable to get the sleep we so desperately desire? Thoughts of taking an important exam, anticipation of a special trip, or distress brought on by concern for a loved one all carry the potential to block the sleep we'd like to have. Fortunately for most, difficulty in getting to sleep is a rare event. For those less fortunate, who suffer **insomnia**, getting to sleep or staying asleep can be a real nightmare.

Oral medications for insomnia may actually worsen the problem. Sleeping pills can be addictive, and they inhibit or suppress REM sleep, leaving the sleep-hungry person feeling even worse than before. Alcohol also suppresses REM sleep: those who have a drink at bedtime to "help me sleep" will find the cure to be worse than the disease.

Stanley Coren's (1996) research sheds some interesting light on insomnia. After collecting EEG data on those who complained about insomnia and those who did not, he asked both groups to estimate how long it took to get to sleep. Insomnia complainers estimated that it took them twice as long to get to sleep than it actually did. Further, they dramatically miscalculated the amount of time they slept, estimating they'd slept half the time they actually had. Perhaps we should keep this research in mind the next time we think we haven't slept much the night before. It's a lot easier to remember, and exaggerate, the times during the night when we were awake than the times we were asleep!

Still, there are several things you can do to increase the quality of your sleep:

- Do not consume caffeinated beverages or foods after 3:00 P.M. Skip that soda with dinner, and turn away from late-night chocolate snacks.
- Get up at the same time every morning. Sleeping late on weekends can make it difficult to get to sleep on Sunday night, leaving you extra tired on Monday morning. Naps can have the same effect: You may not be able to fall asleep at your normal bedtime.
- Avoid nighttime activities that rile you up. Video games, arguments, or a 10-mile run right before attempting to sleep? Not a good idea.
- Try not to sweat it when you can't get to sleep. Remember that it's normal to take 15 minutes or more to fall asleep at night. Besides, sleeping poorly for one night won't cause any great harm, and often you'll be able to sleep better the following night.

► **insomnia** Recurring problems in falling asleep or staying asleep.

Sleeping Aid Those with sleep apnea can turn to this Continuous Positive Airway Pressure (CPAP) machine (and others like it) to help them get the sleep they need.

Sleep Apnea

Losing one night's sleep may not cause significant damage, but **sleep apnea**—a disorder characterized by repeated awakenings throughout the night as a result of not being able to breathe—can leave you exhausted. A person with sleep apnea is a loud snorer who stops breathing at the peak of a heavy, inhaled snore. Breathing may cease for as long as a minute. The only way the person can breathe again is to briefly awaken, which may happen more than 400 times a night. Apnea sufferers (usually male, overweight, and over 40) experience dreadful sleepiness even after a full night's sleep, but they may be unaware they are having such poor-quality sleep.

Some of you are probably thinking, "My dad is heavy and snores like a freight train. Does he have sleep apnea?" I'm not going to advise you to play sleep diagnostician, but if you have a relative or friend who fits this profile, you might want to find out a little more about sleep apnea, and perhaps even suggest that the person be checked for this disorder. Roughly 4 percent of the population suffers from sleep apnea. The most common treatment involves use of a CPAP (Continuous Positive Airway Pressure) machine, which helps the person breathe during the night.

► **sleep apnea** A sleep disorder characterized by temporary cessations of breathing during sleep and consequent momentary reawakenings.

Narcolepsy

Can you imagine what it would be like to suddenly fall asleep because something made you laugh, cry, or feel infuriated? Such is the life of a person with **narcolepsy** (*narco* meaning "numbness," *lepsy* meaning "seizure"), a rare disease (striking 1 in 2000 people) that runs in families. Those with narcolepsy experience sleep attacks when their nervous systems get aroused, often from a strong emotion (Dement, 1978). When an attack occurs, they fall immediately into REM sleep, often at the most inopportune or dangerous times. Imagine being cut off in traffic, getting angry at the other driver, and lapsing into sleep! Fortunately, such incidents are avoidable because narcolepsy is treatable with prescription drugs. If you don't have narcolepsy now, chances are you never will; the onset of this disorder accompanies puberty.

► **narcolepsy** A sleep disorder characterized by uncontrollable sleep attacks. The sufferer lapses directly into REM sleep, often at inopportune times.

Other Sleep Problems

Other sleep-related problems don't qualify as sleep disorders, but they can be very disruptive, nonetheless. The first four on this list typically occur during N-REM delta sleep (Stages 3 and 4).

- **Somnambulism** is sleepwalking. Is it dangerous to wake a sleepwalker? No, but it is difficult to awaken someone who is walking around with brain waves revving up at 1 cycle per second. Is the sleepwalker acting out a dream? Again, no. Remember, most dreams occur during REM sleep, and during that type of sleep, we lose our ability to move around.
- **Night terrors** most often afflict children, who look to all the world like they are awake and terrified, even though they are sound asleep. The child rarely has any memory of the event when told about it in the morning. Nightmares are dreams, so they occur during REM sleep. Night terrors are different. They occur within a few hours of falling asleep, during Stage 4 sleep.
- *Bruxism* is teeth grinding that sounds as though two bricks are being rubbed together. Adults with this problem often wear some kind of tooth guard to keep from wearing away enamel.
- *Enuresis* is bed wetting.
- *Myoclonus* is a sudden jerking of a body part occurring in Stage 1 or 2. Everyone experiences myoclonus now and then, but acute cases can result in daytime symptoms similar to those accompanying sleep apnea.

► **somnambulism** Sleepwalking, which usually starts in the deeper stages of N-REM sleep. The sleepwalker can walk and talk and is able to see but rarely has any memory of the event.

► **night terrors** A sleep-related problem characterized by high arousal and an appearance of being terrified; unlike nightmares, night terrors occur during Stage 4 sleep, within 2 or 3 hours of falling asleep, and are seldom remembered.

Some people appear to get by on as few as four hours of sleep per night. However, the vast majority of these brief sleepers experience negative effects on their bodies, such as memory loss and premature aging, that we cannot immediately see. So, when you're tired and it's time to sleep, pay attention to your body. Cut that last phone call to a friend short, turn off the TV, and give in to the gentle tyrant that is your need for sleep.

"Wait! Don't! It can be dangerous to wake them!"

Is It Dangerous to Awaken a Sleepwalker? No. It's simply difficult to awaken someone whose brain waves are revving along at 1 cycle per second.

REVIEW

Module 20: Sleep, Dreams, and Body Rhythms

What's the Point?

1. *What is consciousness?*

   Consciousness is awareness of yourself and your environment. In sleep, we lose waking consciousness.

Body Rhythms

2. *How do your body's natural rhythms differ from one another?*

   Our bodies have naturally recurring biological rhythms that affect physical processes. Circadian rhythms, such as the sleep-wake cycle, occur approximately once during a 24-hour period. Ultradian rhythms, such as the sleep stages, occur more than once a day. Infradian rhythms, such as bears' hibernation, occur once a month or once a season.

Sleep and Sleep Deficit

3. *What are the costs to your body when you don't get enough sleep?*

   About 80 percent of all students get too little sleep, according to William Dement, a leading sleep researcher. Sleep deprivation decreases the levels of hormones that the body requires for proper functioning, and increases the level of the stress hormone, cortisol, which has been linked to damaged brain cells. Sleep deprivation also is associated with higher risk of accidents, hypertension, concentration problems, and other health problems.

Why We Sleep

4. *How do we benefit from sleeping?*

   Although we know some of the consequences of sleep deprivation, we don't completely understand why sleep is necessary or what sleep does for our bodies. We do know that part of the brain, the hypothalamus, monitors light patterns and triggers bodily changes that make us sleep. The adaptation theory suggests that we sleep at times that help us stay safe, and that sleep aids survival. Others believe that sleep lets our bodies rebuild tissues, consolidate memories, and organize thoughts.

Sleep Stages, REM, and Dreaming

5. *What are the four stages of nondreaming sleep?*

   We have two types of sleep, N-REM sleep, in which we dream very little, and REM sleep, in which we have vivid dreams. The N-REM portion of our sleep has four stages that repeat throughout the night:

   - Stage 1, which lasts about 5 minutes and may contain sensations like the feeling of falling.
   - Stage 2, characterized by spindles (little bursts of brain-wave activity) and higher-amplitude waves.
   - Stages 3 and 4, which combined are known as slow wave, or delta, sleep. Delta sleep diminishes in the second half of a normal night of sleep.

6. *Why is REM sleep sometimes called "paradoxical" sleep?*

   REM (rapid eye movement) sleep usually appears after the first full cycle of N-REM sleep, though it may appear earlier if the sleeper is seriously sleep-deprived. REM sleep is the period of sleep in which we have vivid dreams. The term "paradoxical sleep" reflects two seemingly contradictory and coexistent physical states: internal arousal (rapid eye movements, high pulse and breathing rates, and so on), and external calm and absence of movement. The brainstem blocks messages from the motor cortex during REM sleep, producing temporary paralysis.

7. *What are three modern explanations of dreaming?*

   Sigmund Freud proposed that all dreams are the expression of conflicts over erotic wishes. Modern theories of dreaming propose instead that dreams perform one or more of the following functions: processing information we have collected during waking periods; stimulating the brain and enabling growth; and attempting to make sense of random firing of brain cells in a sort of "connect-the-dots" exercise.

Sleep Disorders and Sleep Problems

8. *What are some common sleep disorders, and what are their consequences?*

   Insomnia is difficulty getting to sleep or staying asleep, often because we are preoccupied with some problem or upcoming event. Medications, alcohol, and other drugs can suppress REM sleep and worsen insomnia. Sleep apnea is characterized by loud snoring and repeated short periods in which breathing stops. Sleep quality is poor, because these sleepers must briefly wake up and catch their breath each time breathing stops. Most people with sleep apnea are middle-aged, overweight men. Narcolepsy is the most dramatic sleep disorder. A person with narcolepsy falls into REM sleep with no warning, usually in the middle of some strongly emotional situation. Other more common sleep problems include sleepwalking (somnambulism), night terrors, teeth grinding (bruxism), bed wetting (enuresis), and sudden jerking movements (myoclonus).

Key Terms

consciousness, p. 378
pseudoscientific claim, p. 378
biological rhythms, p. 378
circadian rhythms, p. 378
ultradian rhythms, p. 378
infradian rhythms, p. 378
melatonin, p. 383
electroencephalograph (EEG), p. 384
spindles, p. 385
delta sleep, p. 385
N-REM sleep, p. 385
REM sleep, p. 386
insomnia, p. 389
sleep apnea, p. 390
narcolepsy, p. 390
somnambulism, p. 391
night terrors, p. 391

Key People

William Dement, p. 380